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Interactive comment on “Observations of rapid aerosol optical depth enhancements in the vicinity of polluted cumulus clouds” by T. F. Eck et al.

Anonymous Referee #2

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Observations of rapid optical depth enhancements in the vicinity of polluted cumulus clouds by T.F. Eck et al.

While not an expert on aerosol and cloud retrieval from remote sensing measurements (this part of the paper should be evaluated in more detail by other reviewers) I greatly enjoyed reading the article. It reports excellent work on a topic that has occupied us for quite some time, and which has been difficult to address based on field measurements and in particular from remote sensing observations. The presented combination of ground based and satellite remote sensing data and aircraft measurements has been well planned, and the data methodically analyzed for interactions between aerosols and non-precipitating cumulus clouds. The data set and resulting analysis are highly rewarding and provide convincing evidence of large enhancements of fine mode aerosols

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associated with the cloud diurnal cycle, i.e., during daytime. The enhancement of AOD can be quite large (factor of 2), well beyond methodological uncertainty.

I have only minor comments and highly recommend publication in ACP.

Minor comments:

p.18809. l.25-50, presents some interesting results on chemical effects (organics, in-organics). Could you please elaborate?

It could be mentioned in the conclusions that this data set would be ideally suited to test models in case studies.

Point 6 of the conclusions could mention that this may have led to underestimation of AOD in AERONET and satellite retrievals.

Some of the figures are too small (should be improved in ACP publication).

The text is full of abbreviations, which is not a problem, but untrained readership could be helped by an appendix listing them.

Please check for typos:

p.18788, l.23, meteorological

p.18789, l.4, Lelieveld; l.12, within minutes

p.18797, l.6, as a consequence

p.18800. l.9, near solar noon

p.18801, l.3, retrievals of the

p.18809, l.25, shows

p.18815, l.22, slight

p.16616, l.2, in -> from

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